

REMARKS

This amendment is responsive to the Office action mailed December 10, 2003 for the above-captioned application.

- The examiner has objected to the drawings for excluding part numbers 131 and 133. A proposed drawing change to Fig. 5 is made to include part numbers 131 and 133.
- The specification has been objected to at page 11 and page 14. Corrections have been made.
- Claims 1-23 have been rejected under 35 USC 103(a) as being unpatentable.
- Claims 1, 9, 10, 13, 18 and 19 are amended.
- Claims 8, 16 and 17 are canceled.
- New claims 24-26 are added.
- Claims 1 and 13 are in independent format
- Claims 1-7, 9-15, and 18-26 are pending.

Objections

The examiner has objected to the drawings for omitting part numbers 131 and 133. Proposed drawing changes to Fig. 5 are submitted including part numbers 131 and 133.

The examiner has objected to the specification at page 11, line 21 due to mislabeling of part number 130 as part number 134. Correction has been made as per the examiner's suggestion.

The examiner has objected to the specification at page 14, lines 27-28 with regard to the term 'alive.' The specification has been amended at page 10 to define the term 'alive.' See the cited art of Sethian for support for this meaning, (Sethian, Level Set Methods and Fast Marching Methods, 2nd ed. 1999 at page 83; and Sethian, A Fast Marching Level Set for Monotonically Advancing Fronts, Proc National Academy of Science, vol. 93, 1996, page 1592, col. 2, second paragraph).

In addition spelling corrections have been made.

The Cited Art and the Claims Distinguished

The examiner has rejected claims 1-23 based on prior art. Claims 1-7, 12, 13-16, and 21-22 have been rejected under 35 USC 103 (a) as being unpatentable over U.S. Patent No. 5,995,115 (Dickie) in view of Geiger et al. ("Dynamic Programming ...") and further in view of Sethian ("Level Set Methods ..."). The examiner has rejected claims 8-10 and 17-19 under 35 USC 103(a) as being unpatentable over Dickie in view of Geiger and Sethian, and further in view of U.S. Patent No. 6,546,117 (Sun et al.). The examiner has rejected claims 11 and 20 under 35 USC 103(a) as being unpatentable over Dickie in view of Geiger and Sethian, and further in view of Guo et al. ("New Video Object Segmentation ...").

Dickie discloses a video editing system for tracing and extracting objects in an image. Geiger et al. disclose a dynamic programming method for segmenting an image. Sethian disclose a narrow band method for recovering a shape from an image. Guo et al. disclose a segmentation method which generates a binary mask of moving objects from a video clip. Sun et al. disclose a segmentation method using an active contour model with global relaxation for defining optimal image object boundaries.

Claims 1 and 13 are in independent format. Claim 1 has been amended to include limitations similar to those in canceled claim 8. Claim 13 has been amended to include limitations in canceled claims 16 and 17.

Claim 1 distinguishes over the cited art based at least upon the following claim limitations:

- updating the initial set of control points to an updated set of control points in response to an operator command;
- deriving a current frame object boundary as a closed contour connecting each control point of the updated set of control points, wherein only image data within the restricted area are eligible to form the closed contour, wherein the step of deriving comprises for each one control point of the updated set of control points deriving a path from said each one control point to an adjacent control point, wherein the step of deriving a path

comprises:

- determining a distance from said one control point to said adjacent control point;
- when said distance is less than a threshold distance applying a first set of rules for deriving the path from said one control point to the adjacent control point; and
- when said distance is greater than the threshold distance applying a second set of rules, different from the first set of rules, for deriving the path from said one control point to the adjacent control point;
- wherein said derived closed contour serves as a current frame object boundary.

The examiner asserts that Sun et al. disclose (i) determining a distance, (ii) eliminating a control point according to a first set of rules when the distance is less than a threshold distance, and (iii) adding a control point according to a second set of rules when the distance exceeds the threshold distance. It is respectfully submitted that such characterization of Sun et al. does not involve the same steps as required by amended claim 1, nor does it suggest such steps.

Note that in claim 1, the set of control points has been updated at one step. The object is to connect the updated control points. A path is derived to connect the control points. For a path between two given control points the path is derived using either a first set of rules or a second set of rules, depending on the distance between the two control points. In the characterization of Sun et al as cited by the examiner, the set of control points is being changed by removing or adding a control point. Once the control points are obtained, however, there is no additional step of using a first set of rules or a second set of rules to derive the path to connect the two control points for which a distance was determined.

In particular claim 1 recites that a distance is determined from one control point to an adjacent control point. A path then is derived from that one control point to the adjacent control point. Thus, the two control points used in the step of determining distance are the same as used in the step of deriving a path. In Sun et al. the two control points used for determining distance are different than the control points for which a path is derived. Thus, sun et al. do teach or suggest using a first set of rules to derive the path between the two control points when the distance is less than a threshold, and using a second set of

rules to derive the path between the two control points when the distance is greater than the threshold,

Claims 2-7 and 9-12 ultimately depend from claim 1 and distinguish over the cited art based at least upon the same reasons as given for claim 1.

Independent claim 13 distinguishes over the cited art based at least upon the following claim limitations:

- means for changing the initial set of control points, the changed set of control points being an updated set of control points, wherein a selected control point among the updated set of control points is either one of a control point added to the initial set of control points or is a control point from the initial set of control points which is relocated;
- a second processor which generates a current-frame object boundary for said object of the current digital image frame using the updated set of control points by deriving a closed contour connecting each control point of the updated set of control points, wherein only image data within the restricted area are eligible to form the closed contour;
- wherein the second processor comprises means for deriving a path from the selected control point to a first adjacent control point and deriving a path from the selected control point to a second adjacent control point, wherein the deriving means comprises:
 - means for determining a distance from said selected control point to said first adjacent control point;
 - when said distance is less than a threshold distance applying a first set of rules for deriving the path from said selected control point to the first adjacent control point; and
 - when said distance is greater than the threshold distance applying a second set of rules, different from the first set of rules, for deriving the path from said selected control point to the first adjacent control point.

Claim 13 distinguishes over the cited art for the same reasons as presented above with regard to claim 1. In particular claim 13 recites that a distance is determined from one

control point to an adjacent control point. A path then is derived from that one control point to the adjacent control point. Thus, the two control points used in the step of determining distance are the same as used in the step of deriving a path. In Sun et al. the two control points used for determining distance are different than the control points for which a path is derived. Thus, sun et al. do teach or suggest using a first set of rules to derive the path between the two control points when the distance is less than a threshold, and using a second set of rules to derive the path between the two control points when the distance is greater than the threshold,

Claims 14-15 and 18-23 ultimately depend from claim 13 and distinguish over the cited art for the same reasons as given for claim 13.

New claims 24-25 depend from claim 1. Claim 24 adds the limitation that a forward marching approach is used when applying the first set of rules. Claim 25 adds the limitations that an outward marching approach is used when applying the second set of rules. Support for claim 24 is found in the specification at page 12, line 32 to page 13, line 19. (In particular see page 12, line 35 to page 13, line 1). Support for claim 25 is found at page 13, lines 20 to page 14 line 5 and page 14, lines 21-29. (In particular see page 13, line 21).

New claim 26 depends from claim 13. Claim 26 adds means for applying a forward marching approach and means for applying an outward marching approach. Support for claim 26 is found at page 12, line 32 to page 14 line 29.

Conclusion

In view of the above remarks regarding the cited art, it is respectfully submitted that the claims contain key limitations that are not present in the cited art and not obvious from the cited art. These particular limitations, are not disclosed in or suggested by cited references. These limitations are significant advances over the prior art and resulted in a novel method and apparatus for segmenting an object in an image frame.

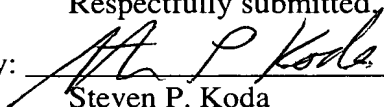
In view of the above amendments and remarks, it is respectfully submitted that the claims

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are now in condition for allowance. The Examiner's action to that end is respectfully requested. Reconsideration of the claims and withdrawal of the rejections is respectfully requested.

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the application, the Examiner is invited to call the undersigned attorney at the telephone number given below.

Dated: 3/03/2004

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